Permit Fact Sheet

General Information

Permit Number:	WI-0021679-09-0
Permittee Name:	Howards Grove Village
Address:	1111 Alcott Ave Howards Grove WI 53083
Discharge Location:	West bank of the Pigeon River one quarter mile upstream of the Millersville Road (CTY JJ, Garton Rd) Bridge.
Receiving Water:	Pigeon River (Pigeon River Watershed – Sheboygan River Basin)
StreamFlow ($Q_{7,10}$):	1.0 cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7-Q_{10} (cfs)	1.7	1.7	3.0	7.9	3.3	2.0	1.5	1.2	1.2	1.5	2.1	1.9

Stream Classification:	Warm water sport fishery, non-public water supply	
Design Flow(s)	Annual Average	0.380 MGD
Significant Industrial Loading?	None	
Operator at Proper Grade?	Yes: Required – A1, B, C, D, L, and P	
Approved Pretreatment Program?	N/A	

Facility Description

The Village of Howards Grove operates a wastewater treatment facility with an annual average design flow of 0.380 MGD. The facility recently was approved for re-rate and increase the calculated capacity of the facility. Treatment consists of manual bar screen and a fine screen, grit removal and washer, four compact plants with aeration ring and center clarifier. Two of the compact plants have half suspended growth aeration and half aerobic sludge digestion. Clarification from the four compact plants goes to the tertiary anthracite filters (four bays). Effluent is re-aerated with air from a blower and then disinfection with UV light. Effluent finally goes through a drop off step aeration before discharge to the Pigeon River. Aluminum sulfate is added for chemical removal of phosphorus. Sludge is aerobically digested and land applied on approved land application sites. The Department found the permittee to be in compliance with the current permit.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)**
701	0.667 MGD (2013-2018)	Influent: 24-Hr flow proportional composite sampler located prior to screening and grit removal. Flow monitor located at vertical pipe prior to pretreatment.
001	0.355 MGD (2013-2018)	Effluent: 24-Hr flow proportional composite sampler located post aeration. Grab samples collected after post aeration and disinfection. Flow meter located at filtration.
002	86 dry US ton (per application)	Aerobically digested, Thickened Liquid, Class B. Representative sludge samples shall be collected from prior to land application.

1 Influent - Proposed Monitoring

Sample Point Number: 701- INFLUENT TO PLANT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
BOD5, Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Phosphorus, Total		mg/L	Weekly	24-Hr Flow Prop Comp	

Changes from Previous Permit:

Sample type updated to 24-Hr flow proportional composite sample type as indicated in the permit application.

Explanation of Limits and Monitoring Requirements

BOD_5 and Total Suspended Solids: Tracking of BOD_5, and Suspended Solids are required for percent removal requirements found in s. NR 210.05, Wis. Adm. Code and in Standard Requirements of the permit.

Phosphorus: Influent phosphorus monitoring can be an important part of operations of a WWTF for phosphorus removal. However, these operational data are not required to be submitted to the Department for enforcement purposes and has been removed from the draft permit.

2 Surface Water - Proposed Monitoring and Limitations

Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
BOD5, Total	Weekly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	May through October
BOD5, Total	Weekly Avg	5.0 mg/L	3/Week	24-Hr Flow Prop Comp	November through April
BOD5, Total	Monthly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	November through April
BOD5, Total	Monthly Avg	5.0 mg/L	3/Week	24-Hr Flow Prop Comp	May through October
Suspended Solids, Total	Weekly Avg	26 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	
Fecal Coliform	Geometric Mean - Wkly	656 #/100 ml	Weekly	Grab	May through September
Fecal Coliform	Geometric Mean - Monthly	400 #/100 ml	Weekly	Grab	May through September
Nitrogen, Ammonia (NH3-N) Total	Daily Max	34 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies November through April.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	10 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies November through March.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	4.5 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies April.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	2.7 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies May through September.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	9.2 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies October.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	4.9 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies November through March.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	2.1 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies April.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	1.8 mg/L	3/Week	24-Hr Flow Prop Comp	Limit applies May through September.
Nitrogen, Ammonia	Monthly Avg	4.3 mg/L	3/Week	24-Hr Flow	Limit applies October.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
(NH3-N) Total				Prop Comp	
Dissolved Oxygen	Daily Min	7.0 mg/L	Daily	Grab	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Phosphorus, Total	Monthly Total	1.0 mg/L	3/Week	24-Hr Flow Prop Comp	This is an interim limit effective through September 30, 2022. See Phosphorus section and schedule.
Phosphorus, Total	Monthly Total	0.225 mg/L	3/Week	24-Hr Flow Prop Comp	This is a final limit effective October 1, 2022.
Phosphorus, Total	6-Month Avg	0.075 mg/L	3/Week	24-Hr Flow Prop Comp	This is a final limit effective October 1, 2022
Phosphorus, Total	6-Month Avg	0.238 lbs/day	3/Week	Calculated	Reporting of mass upon reissuance. Limit effective October 1, 2022. Calculate the daily mass discharge of phosphorus the same days phosphorus sampling occurs. Mass (lbs/day) = concentration (mg/L) x Flow (MGD) x 8.34
Chloride		mg/L	4/Month	24-Hr Flow Prop Comp	Monitoring only throughout the permit term.
Temperature Maximum		deg F	3/Week	Continuous	Monitoring in 2022 only.
Copper, Total Recoverable		ug/L	Weekly	24-Hr Flow Prop Comp	Monitoring in 2022 only.
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See WET section.

Changes from Previous Permit

The sample type was updated for BOD, phosphorus, chloride, and copper to 24-Hr flow proportional composite samples. Weekly average geometric mean fecal coliform limits added. Final total phosphorus concentration and mass limits added effective October 1, 2022. Chloride limits removed and monitoring throughout the permit is retained. Copper sampling was included only in the fourth year of the permit term. Chronic WET tests were reduced to two per permit term.

Explanation of Limits and Monitoring Requirements

Categorical Limits

- **BOD_5, Total Suspended Solids, pH, Dissolved Oxygen, and Fecal Coliforms:** Standard municipal wastewater requirements for BOD_5, total suspended solids, dissolved oxygen, pH, and fecal coliforms are included based on ch. NR 210, Wis. Adm. Code 'Sewage Treatment Works' requirements for discharges to fish and aquatic life streams. Chapter NR 102, Wis. Adm. Code 'Water Quality Standards for Surface Waters' also specifies requirements for pH for fish and aquatic life streams.

  Regulatory changes to s. NR 205.065, Wis. Adm. Code, became effective September 1, 2016 and require limits in this permit to be expressed as weekly average and monthly average limits whenever practicable. These changes are based on 40 CFR 122.45(d), Wis. Adm. Code. Weekly geometric mean fecal coliform limitations were added in the draft permit in order to comply with this regulation.

Water Quality Based Limits and WET Requirements and Disinfection

Refer to the Water Quality-Based Effluent Limitations (WQBELs) memo for the Village of Howards Grove, prepared by Nick Lent dated October 12, 2018 and used for this reissuance.

- **Nitrogen, Ammonia:** Current acute and chronic ammonia toxicity criteria for the protection of aquatic life are included in Table 2C and Table 4B of ch. NR 105, Wis. Adm. Code (effective March 1, 2004). Subchapter IV of ch. NR 106 establishes procedures for calculating water quality-based effluent limitations (WQBELs) for ammonia (effective March 1, 2004). The current daily maximum, weekly average, and monthly average ammonia limits are retained in the proposed permit.

- **Phosphorus, Total:** Revisions to the administrative rules for phosphorus discharge took effect on December 1, 2010. These revisions require an evaluation of the need for water quality based effluent limits. As a result, the recommended water quality-based limit for Jackson is 0.075 mg/L as a six-month average. In addition, a monthly average limit of 0.225 mg/L is recommended. A mass limit is also required for Howards Grove under s. NR 217.14, Wis. Adm. Code, since the discharge is upstream of surface water that is impaired for total phosphorus; a mass limit of 0.238 lbs/day as a six-month average is given. These final phosphorus limits become effective October 1, 2022 per the phosphorus schedule.

  The six-month limits will be expressed as averages covering the periods of November - April and May - October. Based upon current effluent total phosphorus quality and considering an interim limit should reflect a concentration that the facility is able to meet without "temporary" treatment, a 1.0 mg/L interim limit is included in the proposed permit.

  The final water quality-based limits are based on s. NR 217.14 (2), Wis. Adm. Code, with subsequent updates to associated guidance. For the reasons explained in the April 30, 2012 paper entitled 'Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin', WDNR has determined that it is impracticable to express the phosphorus WQBEL for the permittee as a maximum daily or weekly value. The final effluent limit for phosphorus is expressed as a six-month average. It is also expressed as a monthly average equal to three times the derived WQBEL. This final effluent limit was derived from and complies with the applicable water quality criterion. Please see the phosphorus compliance schedule included in the Schedules section.

- **Chloride:** When the representative data is compared to the calculated limits, the data shows there is no reasonable potential to exceed the calculated limits. Therefore, no chloride limits are included in the proposed permit. However, monitoring should continue to monitor effluent chloride concentrations 4/monthly in the proposed permit.

- **Temperature Maximum:** Temperature monitoring is retained in the fourth year of the permit term to ensure adequate data for permit reissuance.

- **Copper, Total Recoverable:** Quarterly copper monitoring was initially included in previous permits. Based on influent copper data submitted from the current permit term the plant continues to see a higher than usual copper loading. Therefore, the monitoring requirement is retained in the proposed permit as weekly monitoring in the fourth year of the permit to ensure adequate data for permit reissuance.

- **Chronic WET:** Whole effluent toxicity (WET) testing requirements are determined in accordance with ss. NR 106.08 and NR 106.09 Wis. Adm. Code, as revised in August 2016. (See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at http://dnr.wi.gov/topic/wastewater/wet.html). Chronic WET tests are scheduled twice in the permit term.

3 Land Application - Proposed Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
002	B	Liquid	Fecal Coliform	Injection	Land Application	43
Does sludge management demonstrate compliance? **Yes**						
Is additional sludge storage required? **No**						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? **No** If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility						
Is a priority pollutant scan required? **No** Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

Sample Point Number: 002- Prior To Land Application

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2020
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2020

Changes from Previous Permit:

No changes made.

Explanation of Limits and Monitoring Requirements

Requirements for land application of municipal sludge are determined in accordance with ch. NR 204 Wis. Adm. Code. Ceiling and high quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7), Wis. Adm. Code for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k), Wis. Adm. Code.

4 Compliance Schedules

4.1 Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus

The permittee shall comply with the WQBELs for Phosphorus as specified. No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification requirement.

Required Action	Due Date
Final Plans and Specifications: Unless the permit has been modified, revoked and reissued, or reissued to include Adaptive Management or Water Quality Trading measures or to include a revised	09/30/2019

schedule based on factors in s. NR 217.17, Wis. Adm. Code, the permittee shall submit final construction plans to the Department for approval pursuant to s. 281.41, Stats., specifying treatment plant upgrades that must be constructed to achieve compliance with final phosphorus WQBELs, and a schedule for completing construction of the upgrades by the complete construction date specified below. (Note: Permit modification, revocation and reissuance, and reissuance are subject to s. 283.53(2), Stats.) Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	
Treatment Plant Upgrade to Meet WQBELs: The permittee shall initiate construction of the upgrades. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2019
Construction Upgrade Progress Report #1: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2020
Construction Upgrade Progress Report #2: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	06/30/2021
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	09/30/2021
Achieve Compliance: The permittee shall achieve compliance with final phosphorus WQBELs. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	09/30/2022

Explanation of Compliance Schedules

This compliance schedule requires continued optimization of phosphorus removal at the treatment plant and submit progress reports on the status of achieving compliance with the final water quality based effluent limits through upgrade of the WWTF. Final phosphorus effluent concentration and mass limitations become effective October 1, 2022.

Special Reporting Requirements

None

Other Comments:

The Department and permittee have discussed accurate flow measurements. The final phosphorus limitations become effective during this permit term including mass limits that require accurate flow measurement.

Attachments:

Substantial Compliance Determination

Water Quality Based Effluent Limits with Map(s)

Public Notice

Proposed Expiration Date:

December 31, 2023

Justification Of Any Waivers From Permit Application Requirements

None

Prepared By: Jennifer Jerich, Wastewater Specialist

Date: 09/09/2018

Amended Post Fact Check Date: 11/08/2018

Amended Post Public Notice Date:

Substantial Compliance Determination

Permittee Name: Howards Grove Village		Permit Number: 0021679-09-0
	Compliance?	Comments
Discharge Limits	Yes	Howards Grove has maintained compliance with their permit discharge limits. One minor exceedence in July 2015.
Sampling/testing requirements	Yes	All sampling and testing is done per permit requirements.
Groundwater standards	NA	
Reporting requirements	Yes	All reports are submitted on time and complete.
Compliance schedules	Yes	Howards Grove is on track with their compliance schedule for phosphorus. All steps are completed on time.
Management plan	NA	
Other:	NA	
Enforcement Considerations	None.	
In substantial compliance?	Yes Comments: Howards Grove WWTP is a well run plant and I find them to be in substantial compliance with their WPDES permit. Signature: Curt Nickels Date: 02/26/2018 Concurrence: Date:	

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: October 12, 2018

TO: Jennifer Jerich – Horicon

FROM: Nick Lent – Milwaukee

SUBJECT: Water Quality-Based Effluent Limitations for Howards Grove Wastewater Treatment Facility
WPDES Permit No. WI-0021679-09-0 (FID 460005260)

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBEL's) using Chapters NR 102, 104, 105, 106, 205, 207, 210 and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Howards Grove Wastewater Treatment Facility in Sheboygan County. This facility discharges to the Pigeon River in the Pigeon River Watershed in in the Sheboygan River Basin in Sheboygan County. The evaluation of the permit recommendations is discussed in more detail in the attached report.

No changes are recommended in permit limitations for BOD_5, ammonia nitrogen, dissolved oxygen, and pH. Based on our review, the following recommendations are made on a chemical-specific basis:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow rate						1,2
BOD_5 November – April May – October			 10 mg/L 5 mg/L	 10 mg/L 5 mg/L		2
TSS			**26 mg/L**	10 mg/L		3
Fecal coliform May – September			**656#/100 mL** **geometric mean**	400#/100 mL geometric mean		3
Ammonia nitrogen November – March April May – September October	 34 mg/L 34 mg/L No limit No limit		 10 mg/L 4.5 mg/L 2.7 mg/L 9.2 mg/L	 4.9 mg/L 2.1 mg/L 1.8 mg/L 4.3 mg/L		2
Dissolved oxygen		7.0 mg/L				2
pH	9.0 s.u.	6.0 s.u.				2
Phosphorus, Total Interim/TBL s. 217.13 WQBEL				 1.0 mg/L 0.225 mg/L	 0.075 mg/L 0.238 lbs/day	
Chloride						1
Copper, total recoverable						1
Temperature, maximum						2,4
Chronic WET						5

Footnotes:

1. Monitoring only.
2. No changes from the current permit.
3. The values in bold is required in accordance with s. NR 205.065(7), Wis. Adm. Code.
4. Daily maximum effluent temperature monitoring only, in the fourth year of the permit.

5. Two chronic WET tests are recommended for permit reissuance. Sampling WET concurrently with chloride is also recommended. Chronic WET testing shall be performed using a dilution series of 100%, 75 %, 50%, 25%, and 12.5%. The Instream Waste Concentration to assess chronic test results is 70 %. The primary control and dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the Pigeon River, upstream and out of the influence of any discharges. Tests should be done in rotating quarters, to collect seasonal information about this discharge and shall continue after the permit expiration date (until the permit is reissued).

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nick Lent at (414) 263 – 8623 or Nicholas.Lent@wisconsin.gov or Diane Figiel at (608) 264-6274 or Diane.Figiel@wisconsin.gov.

1. WQBEL memo – Howards Grove WWTF
2. Site Map
3. Effluent Temperature Limit Calculation Table

PREPARED BY: Nick Lent – Water Resources Engineer, Effluent Limits Calculator

E-cc: Bryan Hartsook, Regional Wastewater Supervisor – Milwaukee
Diane Figiel, Water Resources Engineer – WY/3
Curt Nickels, Wastewater Engineer – Plymouth

Attachment #1

Water Quality-Based Effluent Limitations for
Howards Grove Wastewater Treatment Facility
WPDES Permit No. WI- 0021679-09-0

Prepared by: Nick Lent

PART 1 – BACKGROUND INFORMATION

Facility Description: The Village of Howards Grove operates a wastewater treatment facility with an annual average design flow of 0.380 MGD. The facility serves an estimated population of 3,200 people, and there are no significant or categorical industrial users. Wastewater treatment consists of grit removal, screening, conventional activated sludge, sand filtration, and ultra-violet light disinfection. Aluminum sulfate is added to remove phosphorus. Sludge is aerobically digested, and land applied to approved land application sites or hauled to an approved facility. The wastewater pumping facilities, influent fine screens, and the activated sludge compact treatment plants were recently upgraded (including replacement of diffusers, installation of a dissolved oxygen control system, replacement of aeration blowers, upgrading the alum feed system, electrical and control system improvements and plant site improvements). To meet the water quality-based effluent limit for total phosphorus, the permittee has chosen to upgrade the tertiary treatment process from sand filters to disc filters in the near future.

Existing Permit Limitations: The current permit which expired on September 30, 2018, includes the following effluent limitations.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow rate						1
BOD_5 November – April May - October			 10 mg/L 5 mg/L	 10 mg/L 5 mg/L		2, 3
TSS				10 mg/L		2
Fecal coliform May – September			400 #/100 mL geometric mean			
Ammonia nitrogen November – March April May – September October	 34 mg/L 34 mg/L No limit No limit		 10 mg/L 4.5 mg/L 2.7 mg/L 9.2 mg/L	 4.9 mg/L 2.1 mg/L 1.8 mg/L 4.3 mg/L		2
Dissolved oxygen		7.0 mg/L				2
pH	9.0 s.u.	6.0 s.u.				
Phosphorus, total Interim/TBL s. 217.13 WQBEL				1.0 mg/L 0.225 mg/L	 0.075 mg/L	 4
Chloride			600 mg/L			5
Temperature, maximum						6
Copper, total recoverable						1
Chronic WET						7

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review, because the facility has not demonstrated the need for a change (increase) in these limits under ch. NR 207, Wis. Adm. Code.
3. The existing permit does not specify that a limit applies during the month of April for BOD_5, however this is a typographical error, and the limit of 10 mg/L is coded in SWAMP.
4. The permit includes a compliance schedule to meet the s. NR 217.13 WQBEL by June 30, 2022
5. This is the US EPA approved interim chloride limit. The WQBEL was calculated to be 401 mg/L at the time of last permit reissuance and is reevaluated in Part 3 of this memo.
6. Daily maximum temperature monitoring from July 2016 through June 2017.
7. Three chronic WET tests are required. Instream waste concentration is specified as 98 %.

Receiving Water Information:

- Name: Pigeon River (WBIC 62300)
- Classification: Warmwater Sport Fishery, non-public water supply, Great Lakes Basin
- Previous Low Flow
  Annual 7-Q_{10} = 0.03 cfs (cubic feet per second)
  Annual 7-Q_2 = 0.45 cfs
  Annual Harmonic Mean Flow = 1.2 cfs
- Updated Low Flow: The following 7-Q_{10} and 7-Q_2 provided by USGS for the Pigeon River (USGS Station # 04085458) are used to calculate revised effluent limitations (letter from Rob Waschbusch, USGS, 08/24/2018). The values reflect expected conditions for the Pigeon River upstream of the confluence with Fischer Creek near the Howards Grove WWTF (drainage area = 48.7 sq. mi.). Long term reference data from the Sheboygan River at Sheboygan (station #0408600) was also used when determining these low flow estimates. The Harmonic Mean has been estimated as recommended in *State of Wisconsin Water Quality Rules Implementation Plan* (Publ. WT-511-98)
  Annual 7-Q_{10} = 1.0 cfs
  Annual 7-Q_2 = 2.4 cfs
  Annual Harmonic Mean Flow = 7.01 cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7-Q_{10} (cfs)	1.7	1.7	3.0	7.9	3.3	2.0	1.5	1.2	1.2	1.5	2.1	1.9
7-Q_2 (cfs)	4.8	5.1	11	17	8.7	5.2	3.4	3.1	3.0	4.1	5.8	5.5

- Hardness = 326 mg/L as $CaCO_3$. This value represents the geometric mean of 11 hardness data points from the Pigeon River, as noted in Jim Schmidt's WI hardness summary, December 2015.
- % of low flow used to calculate limits: 25%
- Source of background concentration data: Metals data from the Sheboygan River at Sheboygan Marsh (DNR Water Quality Rules Implementation Plan, Chapter 4, January 1998) is used for this evaluation because there is no data available for the Pigeon River. The Sheboygan River is within the same ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown below. Chloride data from the Pigeon River was taken from the Departments SWIMS database from the closest monitoring location upstream of the discharge. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background metals results used in limit calculations:

Substance	Result
Cadmium	0.084 µg/L
Chromium	0.818 µg/L
Copper	0.344 µg/L
Lead	0.118 µg/L
Mercury	2.166 ng/L
Zinc	0.555 µg/L
Chloride	21 mg/L

- Multiple dischargers: There are no other point source dischargers in the immediate area.
- Impaired water status: The Pigeon River is on the 303(d) list for total phosphorus, from mile 0 – 11. This includes the point of discharge from Howards Grove WWTF.

Effluent Information:

- Design Flow Rate(s):
  Annual average = 0.380 MGD (Million Gallons per Day)
  Peak daily = 1.669 MGD
  Peak weekly = 1.000 MGD
  Peak monthly = 0.735 MGD
  These flows are based on a capacity rerating letter from Andrew Dutcher dated 09/20/2018. The influent flow meter is more accurate and reliable than the current effluent flow meter at the facility. For reference, the average influent flow rate from October 2013 through May 2018 was 0.334 MGD.
- Hardness = 395 mg/L as CaCO3. This value represents the geometric mean of 13 data points collected during the 2014, 2015, and 2017 WET tests, and the 2017 permit application.
- Acute dilution factor used: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Groundwater from domestic wells. No centralized water supply.
- Additives: Aluminum sulfate is used at the wastewater treatment facility for phosphorus removal.
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, primarily metal substances, plus hardness and nitrogen series. Effluent data available from the permit application and all other permit-required monitoring from October 2013 through May 2018 is used in this evaluation. Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC."

	Chloride – mg/L	Copper – µg/L
1-day P_{99}	648.9	37.3
4-day P_{99}	531.7	20.3
30-day P_{99}	465.8	9.3
Mean	430.9	4.8
Standard Deviation	79.6	9.2
Sample size	216	19
Range	192 – 651	< 1 – 36.2

The following table presents the average concentrations at Outfall 001 from Oct 2013 – May 2018 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

	Averages
BOD_5	2.25 mg/L*
TSS	1.13 mg/L*
pH field	7.2 s.u.
Dissolved Oxygen	9.0 mg/L
Phosphorus	0.56 mg/L*
Ammonia Nitrogen	0.24 mg/L*
Chloride	431 mg/L

*Results below the method detection limit (also known as the level of detection, or LOD) were included as zeroes in calculation of average.

PART 2 – BIOLOGICAL OXYGEN DEMAND AND DISSOLVED OXYGEN

The BOD_5 and dissolved oxygen limits may change as a result of the increase in receiving water low flows. However, to allow an increase in a limit above an existing limit the permittee must demonstrate the need for the higher limits consistent with s. NR 207.04(1), Wis. Adm. Code.

In establishing BOD_5 limitations, weekly average limitations are calculated based on 26 pounds of BOD_5 discharged per cfs of flow (after mixing) to produce an edge of mixing zone decrease of 2 mg/L DO. This is done to protect the dissolved oxygen concentrations in the downstream reaches of the Pigeon River during low stream flow conditions.

The "26" value stems from the following equation:

$$\frac{26\,^{lbs}/_{day}}{^{ft^3}/_{sec}} * \frac{1\,day}{86{,}400\,sec} * \frac{454{,}000\,mg}{lbs} * \frac{1\,ft^3}{28.32\,L} = 4.8 = 2.4 * 2\,^{mg}/_{L}$$

The 4.8 has been calculated by taking 2.4 which is the number one receives when converting 26 lbs of BOD/day/cfs into mg/L, multiplied by 2.0 which is the change in the DO level. A typical background DO level for Wisconsin waters is 7 mg/L, so a 2 mg/L decrease is allowed in the calculation to meet the 5 mg/L standard for warm water streams. The above relationship is temperature dependent and an appropriate temperature correction factor is applied. The 26-lb method is based on a typical 24°C summer value for warm water streams. Adjustments for temperature are made using the following equation:

Where k_{24} = 26 lbs of BOD/day/cfs $\quad k_t = k_{24}\left(0.967^{(T-24)}\right)$

The formula for calculating the allowable BOD5 is as follows:

Formula: $\quad \text{Allowable BOD} = \dfrac{2.4 \times (DO_{\text{mix zone}} - DO_{std}) \times (7Q10 + Q_e) \times 0.967^{(Tstream - 24)}}{Q_e}$

Where

Q_e = 0.380 MGD (0.588 cfs)
7-Q_{10} = 1.2 cfs summer, 1.7 cfs winter
DO_{change} = 2 mg/L

Tstream:
Summer = 23 degrees C
Winter = 3 degrees C

Limits for BOD_5 are usually calculated for a minimum of 2 seasons; summer and winter. The data used in the calculations is shown in the table below. The columns could be broken down into shorter time periods to get more specific if increased limits are requested.

BOD_5 EFFLUENT LIMIT CALCULATIONS (26 LB METHOD) RECEIVING WATER: Pigeon River DISCHARGE: Howards Grove WWTF	Summer May - Oct	Winter Nov - Apr
PROPOSED DESIGN FLOW (MGD)	0.380	0.380
RIVER FLOW 7-Q_{10} (cfs)	1.2	1.7
RIVER TEMPERATURE (C)	23	3
EFFLUENT DO (mg/L)	7	7
BACKGROUND DO (mg/L)	7	7
MIX DO (mg/L)	7	7
DO CRITERION (mg/L)	5	5
BOD_5 Concentration Limits (mg/L)	15.1	37.7
BOD_5 Mass Limits (lbs/day)	48	120
Mass = (Design flow MGD)*(BOD_5 mg/L)*(8.34)		

If Howards Grove would like to request an increase to the existing BOD_5 permit limits (5 mg/L summer, 10 mg/L winter), an assessment of their effluent data consistent with the requirements of s. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided to justify the increased limits. This evaluation is on a parameter by parameter basis and includes consideration of operations, maintenance and temporary upsets. If the facility can successfully demonstrate the need for increased effluent limitations, then a recalculation of the specific effluent limitation will be provided.

An initial review suggests that the requirements of s. NR 207.04(1)(a), Wis. Adm. Code, do not appear to be met for BOD_5 based on Howards Grove's effluent data from October 2013 through May 2018. Specifically, effluent concentrations are consistently below 85% of current limitations. **Therefore, no changes to the existing limits for BOD_5 or dissolved oxygen are recommended for permit reissuance.**

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

In general, permit limits for toxic substances are recommended whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P_{99}) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q_{10}

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q_{10} receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards.

$$\text{Limitation} = \frac{(WQC)\,(Qs + (1-f)\,Qe) - (Qs - f\,Qe)\,(Cs)}{Qe}$$

Where:

WQC =Acute toxicity criterion or secondary acute value according to ch. NR 105

Qs = average minimum 1-day flow which occurs once in 10 years (1-day Q_{10}) if the 1-day Q_{10} flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q_{10}).

Qe = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d)

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

Cs = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e).

As a rule of thumb, if the receiving water is effluent dominated under low stream flow conditions, the 1-Q_{10} method of limit calculation probably produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations.

The following tables list the water quality-based effluent limitations for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in term of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0.8 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})).

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		339.8		679.60	135.92	< 8.3		
Cadmium	395	49.82	0.084	99.64	19.93	< 1.3		
Chromium (+3)	301	4445.84	0.818	8891.68	1778.34	< 2.5		
Copper	395	56.72	0.344	113.44			37.3	36.2
Lead	356	364.66	0.118	729.32	145.86	< 4.3		
Nickel	268	1080.28		2160.56	432.11	< 2.6		
Zinc	333	344.68	0.555	689.36	137.87	< 3.5		
Chloride - mg/L		757	21	1514			649	651

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

* * Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q_{10} flow rates yields a less restrictive limit than the 2 × ATC method of limit calculation.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.25 cfs (¼ of the annual 7-Q_{10})

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}	4-day MAX. CONC.
Arsenic		152.2		216.92	43.38	< 8.3		
Cadmium	175	3.82	0.084	5.41	1.08	< 1.3		
Chromium (+3)	301	325.75	0.818	463.91	92.78	< 2.5		
Copper	326	28.45	0.344	40.40			20.3	
Lead	326	87.72	0.118	124.97	24.99	< 4.3		
Nickel	268	120.18		171.28	34.26	< 2.6		
Zinc	326	338.34	0.555	481.97	96.39	< 3.5		
Chloride - mg/L								
Jan – Mar		395	21	665			567	594
Apr – Jun		395	21	713			466	447
Jul – Sep		395	21	586			506	493
Oct – Dec		395	21	634			540	581

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

**the minimum monthly 7-Q_{10} flow for each quarter of the year was used to calculate seasonal chloride limits.

Monthly Average Limits based on Wildlife Criteria (WC):

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 1.75 cfs (¼ of the Harmonic Mean)

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Cadmium	370	0.084	1472.0	294.4	< 1.3	
Chromium (+3)	3818000	0.818	15192207.5	3038441	< 2.5	
Lead	140	0.118	556.7	111.3	< 4.3	
Nickel	43000		171101	34220	< 2.6	

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 1.75 cfs (¼ of the Harmonic Mean)

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Arsenic	13.3		52.92	10.58	< 8.3	

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8) requires the evaluation of the cumulative cancer risk. Because effluent data is available for only one substance for which Human Cancer Criteria exists, and it was not detected in the effluent, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations using s. NR 106.05, Wis. Adm. Code, no effluent limits are needed as a part of this review.

The facility uses ultraviolet light for disinfection, so effluent limits for chlorine aren't needed.

Mercury – Because Howards Grove is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code, the permit application did not require effluent monitoring for mercury. In accordance with s. NR 106.145(3)(a)3., Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from annual sampling during the last permit term was 0.33 mg/kg, with a maximum reported concentration of 0.94 mg/kg. Therefore, no additional effluent mercury monitoring is recommended for permit reissuance.

Chloride – With the use of the updated 7-Q_{10} data for the Pigeon River, none of the 4-day P99s or 4-day maximum concentrations exceed the calculated weekly average limits. This means there is no reasonable potential under s. NR 106.05, Wis. Adm. Code to include an effluent limit in the reissued permit. Therefore, **no effluent limits for chloride are needed for permit reissuance. Continuation of effluent chloride monitoring is recommended to maintain a large enough dataset for representative P_{99} calculations ($n \geq 11$) in the future.** Either one sample once per month or 4 samples once per month (on consecutive days) throughout the permit term would provide sufficient data for the next permit reissuance.

Copper – The 1-day maximum and 1-day P_{99} were below the calculated daily maximum limit, and the 4-day P_{99} was also below the calculated weekly average limit. **Therefore, no water quality-based effluent limits are needed for permit reissuance. Continuation of effluent copper monitoring is recommended to maintain a large enough representative dataset for P_{99} calculations ($n \geq 11$) in the future. Either quarterly monitoring throughout the permit term or monthly monitoring in the fourth year of the permit is recommended.**

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

Effluent limitations for ammonia nitrogen based upon the existing criteria in ch. NR 105, Wis. Adm. Code have been included in the permit since WPDES Permit No -0021679-09-0 was issued effective October 1, 2013. The WQBELs for ammonia nitrogen in the existing permit are summarized in the table below.

Attachment #1

Existing Ammonia Nitrogen WQBELs (mg/L)

	Daily Maximum	Weekly Average	Monthly Average
November - March	34 mg/L	10 mg/L	4.9 mg/L
April	34 mg/L	4.5 mg/L	4.9 mg/L
May - September	no limit	2.7 mg/L	1.8 mg/L
October	no limit	9.2 mg/L	4.3 mg/L

Daily Maximum Limit Discussion: Daily maximum (acute) limitations are based on acute toxicity criteria, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation.

$$ATC \text{ in mg/L} = [A \div (1 + 10^{(7.204 - pH)})] + [B \div (1 + 10^{(pH - 7.204)})]$$

Where: A = 0.411 and B = 58.4 for a Warm Water Sport fishery, and
pH (s.u.) = maximum reasonably expected pH of the effluent

Effluent pH data from the last five years was reviewed as a part of this evaluation. A total of 1691 sample results were reported from October 2013 through May 2018. The maximum reported value was 7.9 s.u. (Standard pH Units), and a pH of 7.7 s.u. or more was reported only 8 times. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.57 s.u. And the mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is also 7.57 s.u. Therefore, a value of 7.6 s.u. (7.57 rounded to nearest tenth) is believed to represent the maximum reasonably expected pH, and most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.6 s.u. into the equation yields an ATC = 17.03 mg/L and a calculated daily maximum limit of 34.06 mg/L (2×ATC).

Potential changes to daily maximum Ammonia Nitrogen effluent limitations:
Updates to subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) outline the option for the Department to implement use of the 1-Q_{10} receiving water low flow to calculate daily maximum ammonia nitrogen limits if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. This typically occurs in effluent dominated situations. The more restrictive calculated limits would apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the lowest monthly 1-Q_{10} (estimated as 80 % of 7-Q_{10}) for each time period and the 2×ATC approach are shown in the following table.

Summary of Calculated Daily Maximum Ammonia Nitrogen Effluent Limitations, in mg/L

	April	May - September	October	November - March
2×ATC	34	34	34	34
1-Q_{10}	200	45	52	56

The calculated daily maximum limit based on the 1-Q_{10} flow is greater than the previous 2 × ATC daily maximum limit, so the 2 × ATC limits are still used in the reasonable potential determination.

Section NR 106.33(2), Wis. Adm. Code, was updated effective September 1, 2016. As a result, seasonal 20 and 40 mg/L thresholds for including ammonia limits in municipal discharge permits are no longer applicable under current rules. As such, s. NR 106.33(1), Wis. Adm. Code, enables the Department to determine the need to include ammonia limits in municipal discharge permits based on the statistical comparisons in s. NR 106.05, Wis. Adm. Code.

Looking at effluent data for the facility, neither the 1-day maximum (13.07 mg/L) or 1-day P_{99} (3.08 mg/L) of effluent data from the current permit term exceed this calculated daily maximum limit, so no new daily maximum ammonia nitrogen effluent limits are needed for permit reissuance. The current permit has a daily maximum limit from November through April, and those limits should be retained consistent with s. NR 106.33(1), (b), Wis. Adm. Code. In conclusion, **no changes to the existing daily maximum limit for ammonia nitrogen are recommended for permit reissuance.**

Weekly Average & Monthly Average Limits based on Chronic Toxicity Criteria (CTC):
The ammonia limit calculation also warrants evaluation of weekly and monthly average limits based on chronic toxicity criteria for ammonia, since those limits relate to the assimilative capacity of the receiving water. The current permit includes weekly and monthly average limits for ammonia that are based on the present criteria, however with the increase in 7-Q_{10} and 7-Q_2 stream flow rates since the last permit reissuance, the calculated limits are increased. They are shown below for informational purposes but may not be included in the reissued permit unless the facility demonstrates the need for the higher limits consistent with s. NR 207.04(1), Wis. Adm. Code.

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Warmwater sport fishery is calculated by the following equation.

$$CTC = E \times \{[0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})]\} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,
E = 0.854,
C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or
C = $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and
T = the temperature (ºC) of the receiving water – (Early Life Stages Present), or
T = the maximum of the actual temperature (ºC) and 7 - (Early Life Stages Absent)

The 4-day criterion is simply equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q_{10} (4-Q_3, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q_5 (estimated as 85% of the 7-Q_2 if the 30-Q_5 is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature. 100% of the flow is used if the Temperature ≥ 16 ºC. Only 25% of the flow is used if the Temperature < 11 ºC. And 50% of the flow is used if the Temperature ≥ 11 ºC but < 16 ºC.

The rules provide a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 ºC, during the winter and spring months. Burbot, an early spawning species, are not believed to be present in the Onion River, based on Department fisheries data.

So "ELS Absent" criteria apply from October through March, and "ELS Present" criteria will apply from April through September for a warmwater sport fish waterbody.

Since minimal ambient data is available, the "default" basin assumed values from ch. NR 102 Wis. Adm. Code, are used for temperature. Basin averages of pH and background ammonia concentrations are also used. These values are shown in the table below, with the resulting criteria and effluent limitations.

		April	May-Sept	October	Nov-March
Background Information:	7-Q_{10} (cfs)	7.9	1.2	1.5	1.7
	7-Q_2 (cfs)	17	3	4.1	4.8
	Ammonia (mg/L)	0.04	0.05	0.05	0.16
	Temperature (°C)	9	23	9	3
	pH (s.u.)	8.21	8.21	7.97	7.97
	% of Flow used	25	100	25	25
	Reference Weekly Flow (cfs)	0.4825	1.93	0.4825	0.4825
	Reference Monthly Flow (cfs)	0.97325	3.893	0.97325	0.97325
Criteria mg/L:	4-day Chronic				
	Early Life Stages Present	4.41	2.55	-	-
	Early Life Stages Absent	-	-	9.06	10.31
	30-day Chronic				
	Early Life Stages Present	1.76	1.02	-	-
	Early Life Stages Absent	-	-	3.63	4.12
Effluent Limitations mg/L:	Weekly Average				
	Early Life Stages Present	19.10	7.66	-	-
	Early Life Stages Absent	-	-	14.81	17.65
	Monthly Average				
	Early Life Stages Present	12.36	5.23	-	-
	Early Life Stages Absent	-	-	8.92	11.00

If Howards Grove would like to request an increase to the existing permit limits for ammonia nitrogen an assessment of their effluent data consistent with the requirements of s. NR 207.04(1)(a) and (c), Wis. Adm. Code must be provided. This evaluation includes consideration of operations, maintenance and temporary upsets. If the facility can successfully demonstrate the need for increased effluent limitations required in ch. NR 207, Wis. Adm. Code, then a recalculation of the specific effluent limitation will be provided.

An initial review suggests that the requirements of s. NR 207.04(1)(a), Wis. Adm. Code, do not appear to be met based on the facility's ammonia nitrogen effluent concentrations from the current permit term's discharge monitoring reports (all data < 85 % of existing effluent limitations). **Therefore, Howards Grove's current weekly and monthly average limits for ammonia nitrogen are recommended to be retained in the reissued permit consistent with s. NR 207.04(2), Wis. Adm. Code.**

Attachment #1

Howards Grove WWTF Ammonia Nitrogen Statistical Evaluation,
October 2013 through May 2018 (mg/L)

	NH_3N Year round
1-day P_{99}	3.08
4-day P_{99}	2.02
30-day P_{99}	0.87
Mean	0.24
Standard deviation	1.12
Sample size & # of non-detects	692 & 222
Range	< 0.01 – 13.07

Conclusion: No changes to the existing daily maximum, weekly average, and monthly average effluent limits for ammonia nitrogen are recommended for permit reissuance.

PART 5 –PHOSPHORUS

Technology Based Limit (TBL)
Wisconsin Administrative Code, ch. NR 217, requires municipal wastewater treatment facilities that discharge or have discharged greater than 150 pounds of total phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit. Since Howards Grove currently has an existing technology-based limit of 1.0 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent water quality-based concentration limit is given.

Water Quality-Based Effluent Limitations:
Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to ch. NR 102 (s. NR 102.06), which establish phosphorus standards for surface waters. Revisions to ch. NR 217 (s. NR 217, Subchapter III) establish procedures for determining water quality based effluent limits for phosphorus, based on the applicable standards in ch. NR 102.

Section NR 102.06(3)(a), Wis. Adm. Code, specifically names reaches of rivers for which a phosphorus criterion of 0.1 mg/L applies. For other stream segments that are not specified in s. NR 102.06(3)(a), Wis. Adm. Code, s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. Therefore, the phosphorus criterion of 0.075 mg/L is applicable to the entire reach of the Pigeon River.

The limit calculation formula is described in s. NR 217.13 (2)(a), Wis. Adm. Code, for phosphorus water quality based effluent limitations (WQBELs):

$$\text{Limitation} = [(WQC)(Qs+(1-f)Qe) – (Qs-fQe)(Cs)]/Qe$$

Where: WQC = Water Quality Criteria = 0.075 mg/L
Qs = 100% of the 7-Q_2 = 2.4 cfs
Cs = median background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code

Qe = Effluent design flow rate = 0.380 MGD (0.588 cfs)
f = the fraction of effluent withdrawn from the receiving water = 0

Section NR 217.13(2)(d), Wis. Adm. Code, specifies that the background phosphorus concentration used in the limit calculation formula shall equal the median of at least four samples collected during the months of May through October, and that all samples collected during a 28-day period shall be considered as a single sample and the average of these concentrations used to determine a median. Averaging begins at date of the first sample in the range of May through October.

There is a limited amount of data stored in SWIMS for upstream on the Pigeon River which meets the definition above (one site with two data points and another with three data points), and most of the data is over ten years old. More recently however, the permittee collected in stream total phosphorus data from several nearby locations two times per month from March through October 2015. The closest upstream monitoring location from the WWTF was at Roosevelt Avenue, near the northern boundary of Howards Grove (approximately 1.5 miles upstream from the discharge). Available total phosphorus data from May through October 2015 at this location is summarized below (in mg/L);

Station Name	Roosevelt Ave
Waterbody	Pigeon River
Sample Count	12 (during May – Oct)
First Sample	05/11/2015
Last Sample	10/27/2015
Mean	0.208
Median	0.198
NR 217 Median	0.195

Substituting a median value of 0.195 mg/L into the limit calculation equation above would result in a calculated limit that is less than the applicable criterion of 0.075 mg/L. However, s. NR 217.13(7), Wis. Adm. Code, specifies that "if the water quality-based effluent limitation calculated pursuant to the procedures in this section is less than the phosphorus criterion specified in s. NR 102.06, Wis. Adm. Code, for the water body, the effluent limit shall be set equal to the criterion."

Reasonable Potential Determination
In accordance with s. NR 217.15(2), Wis. Adm. Code, there is reasonable potential for the discharge to cause or contribute to an exceedance of the water quality criteria, because Howards Grove is subject to the phosphorus TBL, and the calculated WQBEL is less than the TBL.

Limit Expression
Because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 mg/L may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is included in the permit, a monthly average concentration limitation of 0.225 mg/L, equal to three times the WQBEL calculated under s. NR 217.13 shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Mass Limits
The Pigeon River was assessed and 303d listed as impaired for total phosphorus in the 2012 assessment cycle. The 2012 list was approved in mid-2013. Because the discharge is to a surface water that is listed

as impaired for total phosphorus, a mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. **This final mass limit shall be 0.238 lbs/day expressed as a six-month average (0.075 mg/L × 8.34 × 0.380 MGD).**

Interim Limit: The existing permit includes a 9-year compliance schedule to meet the WQBEL of 0.075 mg/L by September 30, 2022 and has an interim effluent total phosphorus limit of 1.0 mg/L as a monthly average. The interim limit was selected because it represented good management and operation for similar treatment processes, without requiring the facility to invest in additional "temporary" treatment. Effluent total phosphorus data from October 2013 through May 2018 is presented in the table below. Based upon this data, **no changes from the current monthly average interim limit of 1.0 mg/L are recommended for permit reissuance.** This value is recommended instead of the 4-day or 30-day P_{99} concentration of to retain operational flexibility during the planned facility upgrades to meet the final WQBELs.

Howards Grove WWTF Effluent Data Summary, October 2013 through May 2018

Total Phosphorus Statistics, mg/L	
1-day P_{99}	1.25
4-day P_{99}	0.86
30-day P_{99}	0.66
Mean	0.56
Standard deviation	0.22
Sample Size	693
Range	0.047 – 1.857

PART 6 –THERMAL

New surface water quality standards for temperature took effect on October 1, 2010. These new regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. The influent flow meter is more accurate and reliable than effluent flow meter at the facility, so the calculations were based off the influent flow reported from October 2013 – May 2018, and 25% mixing with the monthly 7-Q_{10} low flows of the Pigeon River.

The table below summarizes the maximum temperatures reported during monitoring from January through December 2017. Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are highlighted in bold. The complete thermal table used for calculation is attached.

Attachment #1

Month	Representative Highest Monthly Effluent Temperature		**Calculated Effluent Limit**	
	Weekly Maximum (°F)	Daily Maximum (°F)	**Weekly Average Effluent Limitation** (°F)	**Daily Maximum Effluent Limitation** (°F)
JAN	53	54	57	94
FEB	50	51	57	93
MAR	49	50	61	93
APR	52	53	66	105
MAY	55	56	71	94
JUN	60	61	81	91
JUL	64	64	89	92
AUG	65	68	89	91
SEP	65	66	81	92
OCT	65	66	67	92
NOV	61	62	**55**	91
DEC	58	59	**55**	88

Howards Grove submitted a dissipative cooling study on March 18, 2013, which included assessments of temperature collected near the outfall on January 6, 2013. The study was approved on April 2, 2013 and is saved in SWAMP. The data demonstrated that the discharge does not increase water temperature beyond ambient temperatures and does not cause any exceedances of sub-lethal temperature standards beyond a very small mixing zone. Therefore, an exemption from the sub-lethal (weekly average) effluent temperature limits was granted in the current permit, under s. NR 106.59(4), Wis. Adm. Code, dissipative cooling (DC) request.

Dissipative cooling requests must be re-evaluated every permit reissuance. The permittee is responsible to submit an updated request prior to permit reissuance. Such a request must either include:

a) A statement by the permittee that there have been no substantial changes in operation of, or thermal loadings to, the treatment facility and the receiving water; or

b) Additional information demonstrating DC to supplement the information used in the previous DC determination. If significant changes in operation or thermal loads have occurred, additional DC data must be submitted to the Department.

The permitee has stated that there have been no substantial changes in the operation of the treatment facility and thermal loadings to the receiving water. Therefore, no effluent temperature limits are required, however **daily maximum effluent temperature monitoring is recommended during the fourth year of the reissued permit to allow for updated data at the next permit reissuance.**

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. The following evaluation is based on procedures in the Department's WET Program Guidance Document (revision #11, dated November 1, 2016).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent.

- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC). The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 70 % shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6):

$$IWC\ (as\ \%) = Q_e \div \{(1 - f)Q_e + Q_s\} \times 100$$

Where:

Q_e = annual average flow = 0.380 MGD = 0.588 cfs
f = fraction of the Q_e withdrawn from the receiving water = 0
Q_s = ¼ of the 7-Q_{10} = 1.0 cfs ÷ 4 = 0.25 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (referenced in s. NR 219.04, Wis. Adm. Code), the default acute dilution series is: 6.25, 12.5, 25, 50, 100%, and the default chronic dilution series is 12.5, 25, 50, 75, 100%. The permittee or Department staff may choose other dilution series, but alternate dilution series must be specified in the WPDES permit. For guidance on selecting an alternate dilution series, see Chapter 2.11 of the WET Guidance Document.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in "chronic" WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the Pigeon River, upstream/out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data. Data which is not believed to be representative of the discharge is not included in reasonable potential calculations. The

table below differentiates between tests used and not used when making WET determinations.

WET Data History

Date Initiated	Chronic Results IC_{25} %				Footnotes or Comments
	C. dubia	Fathead Minnow	Pass or Fail?	Use in RP?	
09/23/2014	>100	>100	Pass	Yes	
06/02/2015	>100	>100	Pass	Yes	
05/02/2017	>100	>100	Pass	Yes	

- WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

  According to s. NR 106.08(6)(d), TUa effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC50. IC25 or IC 50 ≥ 100%.). All chronic WET tests had results greater than 100, therefore, RP = 0 and there is no reasonable potential to include an acute or chronic WET limit.

The WET Checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other permit conditions. The Checklist steps the user through a series of questions that evaluate the potential for effluent toxicity. The Checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code, and recommends monitoring frequencies based on points accumulated during the Checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. The completed WET Checklist recommendations for this permittee are summarized in the table below. Staff recommendations, based on the WET Checklist and best professional judgment, are provided below the summary table. For guidance related to RP and the WET Checklist, see Chapter 1.3 of the WET Guidance Document: http://dnr.wi.gov/topic/wastewater/WETguidance.html.

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 70 % **15 Points**
Historical Data	No test results available within last 5 years **5 Points**	All results >100 **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	Full fish and aquatic life **5 Points**	Same as Acute. **5 Points**

Attachment #1

	Acute	Chronic
Chemical-Specific Data	No limits based on ATC (0 pts); ammonia, copper, and chloride detected (3 pts). **3 Points**	No limits based on CTC (0 pts); ammonia, copper, and chloride detected (3 pts). **3 Points**
Additives	0 Biocides and 1 Water Quality Conditioners added. SorbX-100 Used: No **1 Points**	All additives used more than once per 4 days. **1 Points**
Discharge Category	0 Industrial Contributors. **0 Points**	Same as Acute. **0 Points**
Wastewater Treatment	Secondary or Better **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**14 Points**	**24 Points**
Recommended Monitoring Frequency (from Checklist):	No tests (≤ 14 points)	Two tests during permit term (year 2, 4, 6, etc)
Limit Required?	No	No
TRE Recommended? (from Checklist)	No	No

- Following the guidance provided in the Department's WET Program Guidance Document (revision #11, dated November 1, 2016), based upon the point totals generated by the WET Checklist, other information given above, and Chapter 1.3 of the WET Guidance Document, no acute WET tests and two chronic WET tests are recommended for permit reissuance. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing shall continue after the permit expiration date (until the permit is reissued).

PART 8 – EXPRESSION OF LIMITS

Revisions to ch. NR 106 and 205, Wis. Adm. Code align Wisconsin's water quality-based effluent limitations with 40 CFR 122.45(d), which requires WPDES permits contain the following concentration limits, whenever practicable and necessary to protect water quality:

- Weekly average and monthly average limitations for continuous discharges subject to ch. NR 210, Wis. Adm. Code.
- Daily maximum and monthly average limitations for all other discharges.

Howards Grove WWTF is a municipal treatment facility and is therefore subject to the need for weekly average and monthly average limitations whenever limitations are determined to be necessary.

This evaluation provides additional limitations necessary to comply with the expression of limits in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code. Pollutants already compliant with these rules or that have an approved impracticability demonstration, are excluded from this evaluation including water-quality based effluent limitations for phosphorus, temperature, and pH, among other parameters. Mass limitations are not subject to the limit expression requirements if concentrations limits are given.

The methods for calculating limitations for continuous discharges subject to ch. NR 210, Wis. Adm. Code, to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(3), Wis. Adm. Code, and are as follows:

1. Whenever a daily maximum limitation is determined necessary to protect water quality, a weekly and monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.
2. Whenever a weekly average limitation is determined necessary to protect water quality, a monthly average limitation shall also be included in the permit and set equal to the weekly average limit unless a more restrictive limit is already determined necessary to protect water quality.
3. Whenever a monthly average limitation is determined necessary to protect water quality, a weekly average limit shall be calculated using the following procedure and included in the permit unless a more restrictive limit is already determined necessary to protect water quality:

Weekly Average Limitation = (Monthly Average Limitation × MF)

Where: MF= Multiplication factor as defined in Table 1

CV= coefficient of variation (CV) as calculated in s. NR 106.07(5m), Wis. Adm. Code [CV = Standard deviation/arithmetic mean]

n= the number of samples per month required in the permit

s. NR 106.07 (3) (e) 4. Table 1 — Multiplication Factor (for CV = 0.6)

CV	n=1	n=2	n=3	n=4	n=8	n=12	n=16	n=20	n=24	n=30
0.6	1.00	1.31	1.51	1.64	1.95	2.12	2.23	2.30	2.36	2.43
1.0	1.00	1.37	1.63	1.83	2.34	2.64	2.85	3.01	3.13	3.27

Note: This methodology is based on the *Technical Support Document for Water Quality-based Toxics Control* (March 1991). PB91-127415.

A review of the existing permit's effluent limits, plus any recommended limits from this evaluation shows that adjustments to effluent limitations are needed for TSS and fecal coliforms.

TSS: The existing permit has a TSS limit of 10 mg/L as a monthly average, so the reissued permit will also need to have a weekly average limit to meet limit expression requirements. The 3x/week monitoring frequency for TSS at Howards Grove is anticipated to remain unchanged in the reissued permit, therefore the average number of samples expected per month is 12 (rounded to the nearest number in the table above).

Over 200 of 700 of the TSS data points from October 2013 through May 2018 were non-detects (results less than the level of detection). To calculate a coefficient of variation for TSS for this case, all days that were reported as non-detect values were treated as if the true result were half of the LOD (LOD not indicated in DMRs but usually around 1 mg/L), to more accurately determine a coefficient of variation. This is because treating the non-detects as zero artificially reduces the mean, and increases the standard deviation, both of which increase the coefficient of variation. The only other adjustment to the dataset was that a single effluent result of 29 mg/L (04/13/2014) was removed from the dataset due to the extremely intense rainfalls and high flows during that period. The resulting coefficient of variation is 1.03 (standard deviation of 1.277 mg/L divided by the average of 1.243 mg/L). Using a coefficient of variation of 1.0 for TSS data, and n = 12, the multiplication factor is 2.64. **Therefore, a weekly average limit of 26 mg/L is recommended to be included in the reissued permit in addition to the existing**

monthly average limit. This limit may be revisited in the future based on updated evaluations of effluent data and variability.

Fecal Coliforms: The existing permit has a fecal coliform effluent limit of 400 #/100mL as a monthly geometric mean, so the reissued permit will also need to have a weekly geometric mean limit to meet limit expression requirements. The once per week monitoring frequency for fecal coliforms at Howards Grove is anticipated to remain unchanged in the reissued permit, therefore the average number of samples expected per month is 4 (rounded to the nearest number in the table above).

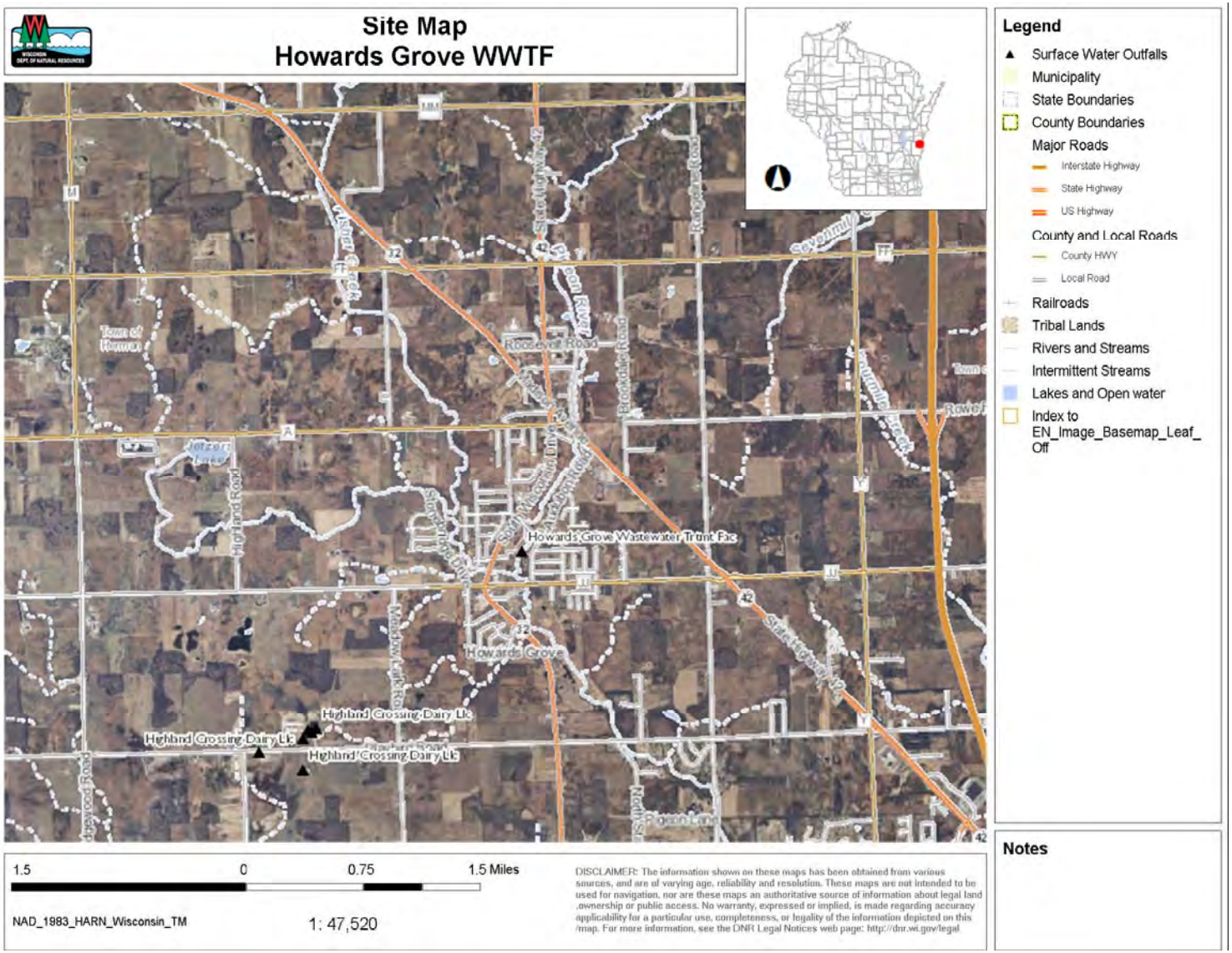
Using a coefficient of variation of 0.6 for fecal coliform data, and n=4, the multiplication factor is 1.64. 1.64 × 400#/100 mL = 656#/100 mL. **Therefore, a weekly geometric mean limit of 656 #/100 mL is recommended to be included in the reissued permit in addition to the existing monthly geometric mean limit.**

Additional limitations needed to comply with s. NR 106.07, Wis. Adm. Code, Expression of Limits:

Parameter	Weekly Average	Monthly Average	Weekly Geometric Mean	Monthly Geometric Mean	Multiplication Factor (CV)	Assumed Monitoring Frequency (n)
TSS	**26 mg/L**	10 mg/L			2.64 (1.0)	3x / Week (12)
Fecal coliform May - September			**656#/100mL**	400#/100mL	1.64 (0.6)	Weekly (4)

There are no other parameters which need additional effluent limit expression to meet code requirements.

Attachment #2



Site Map

Attachment #3

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Howards Grove WWTF	**Data Range**		**7-Q_{10}:**	1 cfs
Outfall(s):	001	**Start:**	10/01/13	**Dilution:**	25%
Date Prepared:	30-Aug-18	**End:**	05/31/18	**f:**	0
Design Flow (Qe):	0.38 MGD			**Stream type:**	Small warm water sport or forage fish commun
Region:	SER			**Qs:Qe ratio:**	0.4 :1
				Calculation Needed?	YES

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs)	Representative Highest Effluent Flow Rate (Qe)		Representative Highest Monthly Effluent Temperature		99th Percentile of Representative Data		**Calculated Effluent Limits**	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Ave (Qesl)	Daily Max Flow Rate (Qea)	Weekly Ave	Daily Max	Weekly Ave	Daily Max*	**Weekly Ave Limit**	**Daily Max Limit**
	(°F)	(°F)	(°F)	(cfs)	(MGD)	(MGD)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
JAN	33	49	76	1.70	0.578	0.664	53	54	53	54	57	94
FEB	34	50	76	1.70	0.588	0.699	50	51	51	51	57	93
MAR	38	52	77	3.00	0.795	1.147	49	50	49	50	61	93
APR	48	55	79	7.90	0.835	1.520	52	53	52	53	66	105
MAY	58	65	82	3.30	0.624	1.089	55	56	56	58	71	94
JUN	66	76	84	2.00	0.595	0.875	60	61	60	61	81	91
JUL	69	81	85	1.50	0.387	0.523	64	64	64	65	89	92
AUG	67	81	84	1.20	0.334	0.466	65	68	65	67	89	91
SEP	60	73	82	1.20	0.333	0.438	65	66	65	66	81	92
OCT	50	61	80	1.50	0.432	0.593	65	66	65	66	67	92
NOV	40	49	77	2.10	0.533	0.908	**61**	62	**61**	62	**55**	91
DEC	35	49	76	1.90	0.674	1.077	**58**	59	**58**	60	**55**	88

Although the maximum weekly average effluent temperature may exceed the calculated weekly average effluent temperature limitations during the month of November and December, **no limits are recommended because the facility has demonstrated dissipative cooling near the point of discharge at outfall 001** as described in s. NR 106.59(4), Wis. Adm. Code. Daily maximum effluent temperature monitoring is recommended for the fourth year of the permit to have updated data for the next permit reissuance.

Effluent Temperature Limit Calculation Table